Chapter Two
AVIATION DEMAND FORECASTS

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The proper planning of a facility of any type must begin with a definition of the needs that the facility can reasonably be expected to serve over the specified planning period. At Mesa-Falcon Field, this involves the development of a set of forecasts that may best define the potential of future aviation demand. Forecasts of general aviation activity at the airport can be used as a basis for determining the types and sizes of aviation facilities required to meet the aviation needs of the Mesa Area through the year 2015.

Aviation forecasts are applied to several phases of the Master Plan Study. Initially, they are used to analyze the capacity of the airfield, the terminal and apron area, and the access system. They are also used to evaluate the role of Mesa-Falcon Field in the regional airport system. Later in the study, they will be used in the financial analysis and alternative development actions. Finally, the aviation forecasts are used to develop measures of aircraft noise.

The primary objective of a forecasting effort is to define the magnitude of change that can be expected over time. Because of the cyclical nature of the economy, it is virtually impossible to predict with certainty aviation activity on a year-to-year basis over an extended period of time. However, a growth curve can be established to predict the overall long-term growth potential.

While a single line is often used to express the anticipated growth, it is important to remember that actual growth may fluctuate above and below this line. For this reason, graphical depictions of aviation forecasts in this chapter will include a forecast envelope, serving as a reminder that actual growth in activity seldom follows a simple straight line or mathematical curve. The primary point to remember about forecasts is that they serve only as guidelines, and planning must remain flexible to respond to unforeseen events.

Aviation activity at an airport is influenced by many external factors, as well as by the facilities and services available. Few industries have seen as dramatic a change as the aviation industry since the first powered flight. Major technological advancements, as well as regulatory and economic actions, have resulted in erratic growth patterns which have had significant impacts upon aviation activity.

More recently, regulatory actions and economic factors have resulted in very significant impacts upon activity patterns at most airports. The following sections attempt to define the historical trends and discuss how other influences may affect future trends in establishing forecasts of aviation activity for Mesa-Falcon Field.

FORECASTING METHODOLOGY

The systematic development of aviation forecasts involves both analytical and judgmental processes. A series of mathematical relationships are tested to establish statistical and logical rationale for projected growth. However, the judgment of the forecast analyst, based upon professional experience and detailed knowledge of the situation, is important in the final subjective determination of the preferred forecast.

The analysis begins with the assessment of historical trends as data is collected and sorted on a variety of aviation indicators at the local, regional, and national level. Data on aviation related factors such as aircraft operations, based and registered aircraft, and fuel sales were obtained for the analyses. Similarly, socioeconomic factors such as population, income, and employment are also analyzed for the effect they have had on aviation activity. The identification and comparison of the relationships between these various indicators provides the initial step in the development of realistic forecasts of aviation demand.

As part of the analytical process, trend lines based upon historic relationships are extended into the future based upon these techniques and assumptions. Trend lines developed through the use of a variety of techniques are called projections. After preparing several such projections, the analyst is able to identify a range of growth within which the actual trend will probably fall.

FORECAST METHODOLOGY

The most reliable approach to estimating future aviation demand is the use of several analytical models, and a comparison of the results. The most common techniques used include the following: correlation analysis, regression analysis, time-series extrapolation, and market-share analysis.

Correlation analysis examines the direct relationship between two or more sets of historical data. Used primarily as a statistical test on a multiplicity of variables, this analysis will detect significant correlations between sets of data. These sets can then be evaluated further using regression analysis.

In **regression analysis**, projections of an aviation demand element (the dependent variable) are prepared based upon its relationship to one or more aviation indicators, known as the independent variables. Aircraft operations and based aircraft are examples of dependent variables, while population, per capita income, gross national product, and other socioeconomic factors are examples of independent variables. Linear, curvilinear, and multiple regression analyses all can be tested to attempt to define a relationship from which future activity can be projected.

Time-series, least squares extrapolation is probably the simplest, most widely used method of forecasting. This technique involves the fit of classical growth curves to future years. In utilizing this technique, an

assumption is made that the same factors that have affected aviation demand in the past will continue to affect aviation demand in the future. While this can be a rather broad assumption, it provides a reliable benchmark for comparing the results of other analyses.

The **market-share** technique involves a review of the activity at Mesa-Falcon Field in terms of a larger aviation market. The local share-of-the-market factor is multiplied by forecasts of the larger market for a projection. This *top-down* approach proves useful as a check on the validity of projections based on other techniques.

Using a broad spectrum of local, regional, and national socioeconomic information, surveys and aviation trends, forecasts are developed in the following sections for several key aviation activity categories, including:

- Based Aircraft
- Aircraft Mix
- Aircraft Operations
- Peaking Characteristics
- Annual Instrument Approaches

At this point, the judgmental phase comes into play. The analyst must study the various growth elements and utilizing experienced professional judgment, weigh several other intangible factors before finalizing a preferred forecast. These factors include:

- Uses for which the forecast is being developed.
- Character of the community.
- Potential changes in the general business environs.
- State-of-the-art advances in technology.
- Impact of new facilities or improved services.
- Policies of the airport owner and operator.

Two important considerations bear upon the finalization of forecasts for planning purposes. First, one cannot assume a high level of confidence in forecasts that extend beyond five years. However, more than five years is often needed to complete a facilities development program, and at least twenty years is necessary to adequately amortize most capital improvements. The second consideration is the level of optimism reflected in the forecasts. The planning effort must design in a degree of flexibility that will be responsive to deviations from the preferred forecasts.

TRENDS AT THE NATIONAL LEVEL

Each year, the FAA publishes a national forecast of aviation activity. Included in these projections are categories for air carriers, air taxi/commuters, general aviation, and military activity. The forecasts are prepared to meet budget and planning needs of the constituent units of the FAA, and to provide information that can be used by state and local authorities, the aviation industry, and by the general public.

The current edition of the **FAA Aviation Forecasts, Fiscal Years 1991-2002,** was used to prepare the basis for the series of forecasts presented for Mesa-Falcon Field. A synopsis of existing and future conditions in the aviation industry is presented in the paragraphs that follow.

The total active general aviation fleet increased from 210,266 active general aviation aircraft in 1989 to 219,737 in 1990. Single engine piston aircraft increased from 164,760 to 170,370 during the 1989-90 period, nearly recovering to the total number of active single engine aircraft existing in 1987 (171,035). The multi-engine aircraft grew from 22,797 in 1989 to 23,445 in 1990 and the turboprop aircraft from 5,259 to 6,324 during the same period. The turbojet and rotary aircraft also experienced an increase in numbers, growing from 4,187 and 6,406, respectively to 4,402 and 7,475.
Total aircraft shipments declined during this period after having reversed a downward

trend during the 1987-1989 period. Single engine piston aircraft declined by 25.5 percent in 1990 while multi-engine aircraft shipments remained the same. Continuing a trend that has been consistent since deregulation (although the numbers have declined), turbojet and rotary aircraft shipments increased 4.9 and 7.0 percent, respectively in 1990. Although net export billings increased in 1990, the total number of aircraft shipped overseas declined 21.9 percent from 1989. As always, the export of general aviation aircraft is affected by the price of the aircraft, the exchange rate of the U.S. dollar and the national economic condition.

The FAA has recently found that general aviation forecasts do not follow the "normal" trends, i.e., traditional economic variables. On the whole, general aviation did not respond to the economic recovery between 1982-1989, one of the most robust since the postwar period.

Several factors have played a major role in this disparity, such as higher aircraft prices, operating costs, interest rates and product liability costs. Aircraft deregulation has also affected general aviation. Increased service and better connections have reduced the demand for private flights to destinations not served by commercial airlines. However, the recent rise in airline fares and increased congestion at airports may make the general aviation alternative more attractive in the future. There are those who believe the overvalued dollar severely depressed the export market. Some combination of these factors is surely responsible, and their negative impact has outweighed the positive effects of a growing economy.

Just as general aviation consists of many variable components, so are the reasons that motivate general aviation activity. The FAA Forecast Branch has deemed it necessary to address this problem and is attempting to revise its approach to general aviation forecasting techniques.

Summarizing the assumptions under which the forecasts were developed, the active general aviation fleet is expected to grow a modest 0.4 percent annually over the FAA's 12-year forecasting period. The single engine piston fleet will remain almost constant over the period, growing from 170,370 in 1990 to 170,500 in 2002. The fleet is expected to grow faster in the next six years, averaging about 1.2 percent annual growth before declining in the next six years at an average annual decline of 0.2 percent.

A slight increase in the number of multi-engine aircraft is also predicted, from 23,445 in 1990 to 24,000 in 2002. Reflecting the increasing sophistication of general aviation aircraft, turbine powered aircraft are anticipated to increase from 10,726 in 1990 to 15,000 in 2002, an average annual growth rate of 3.3 percent. The turbine rotary aircraft are expected to grow at an average rate of 6.1 percent annually.

The pilot population is also anticipated to increase with most of the growth coming in the number of airline pilots needed to meet the growing demand (3.1 percent annually) while private pilot growth will nearly match that of the single engine piston aircraft growth (0.3 percent annually to 2002).

GENERAL AVIATION DEMAND

General aviation is defined as that portion of aviation which encompasses all facets of aviation except commercial airline and military operations. To determine the types and sizes of facilities that should be planned to handle general aviation activity, certain elements of this activity must be forecast. These indicators of general aviation demand include the following:

- Based Aircraft
- Aircraft Fleet Mix
- Annual Aircraft Operations
- Peaking Characteristics

The number of based aircraft is the most basic indicator of general aviation demand. By first developing a forecast of based aircraft, the growth of the other indicators can be projected based upon this growth and other factors characteristic of Mesa-Falcon Field and the Phoenix Metropolitan Area. The rationale behind the general aviation activity forecast is presented below.

BASED AIRCRAFT

The primary indicators of demand at general aviation airports are based aircraft, and aircraft operations. Because activity at an airport will depend largely upon the number of based aircraft, the factors that influence basing potential are examined closely. This data has been examined on state and regional levels in the past. Forecasts based upon local conditions will be developed and compared to the projections in previous studies. The local forecasts will examine various economic and demographic factors along with historical trends.

Historical trends

The historical data on based aircraft at Mesa-Falcon Field depends upon the source and the methodology used to derive the figures. based aircraft figures for this airport, due to the large number of aircraft at the airport, vary depending upon the agency collecting the data. Some agencies such as the Arizona Department of Transportation Aeronautics Division (ADOT) and the Maricopa Association of Governments (MAG) use active state aircraft registrations, while the FAA uses active federal aircraft registrations. Some states require registration of aircraft and others do not. Aircraft registered in one state may hangar or base in another state and might not be counted in the state where the aircraft is based.

Airport sponsors use various methods of counting aircraft and, invariably, these counts are in disagreement with the state or federal records. Some airport sponsors count all aircraft physically on the airport whether flyable or not, while others will not count aircraft that do not fly or fly very little. Tabulations may vary depending upon the accounting period of the information (first of the year, mid-year or end of the year). Due to these differences in based aircraft counts, the forecaster must ensure that the integrity of each source remains intact (based aircraft numbers are not interchanged between different sources). In this way, the trends and rates established by the historical figures can be analyzed and distortion minimized.

Table 2A shows the historical data on registered aircraft for the State, Maricopa County and based aircraft at Mesa-Falcon Field dating back to 1980.

TABLE 2A
Aircraft Populations

Year	Arizona[1]	Maricopa[2] County	Falcon[3] Field
1980	5,832	3,403	587
1981	5,863	3,384	767
1982	5,874	3,374	774
1983	6,025	3,617	782
1984	6,158	3,538	743
1985	6,182	3,547	768
1986	6,235	3,645	784
1987	6,272	3,555	692
1988	6,194	3,415	682
1989	6,354	3,261	673
1990	5,754	3,275	643

SOURCE:
(1) Arizona Aviation Needs Study, 1988 and Arizona SASP, 1990.
(2) Maricopa Association of Governments (MAG), Regional Airport System Plan (RASP), 1990.
(3) Airport Records, Jan 1980 - Jul 1991.

Trends were developed for registered aircraft in the County and also based aircraft at Mesa-Falcon Field. The aircraft registered in Maricopa County doubled in the 7 year period from 1970 to 1977. More recently, the County aircraft population has doubled in the 10 year period from 1974 to 1984. The

latter was a period of particularly strong economic growth in the region through 1987-88 and has been followed by an economic recession the past three years. This is reflected in the 1988-1989 County figures (although a turnaround appears in 1990).

Due to the up and down characteristic of based aircraft at Falcon Field, it is not totally clear what effects the economic cycles have had on the aircraft population. A dramatic growth in the number of based aircraft took place in the 1980-1981 period which has not been duplicated. Based aircraft increased steadily until 1986 when the downturn began in the numbers of based aircraft at the airport (which has continued through 1990). The overall long term growth rate for the 1980-1990 period has been approximately one percent annually.

The airport's records, meticulously derived by airport staff each month since 1980, indicate that the airport's based aircraft fluctuate greatly during the calendar year. The general pattern is for based aircraft to increase in numbers during the winter months (probably due to the influx of winter visitors to the area), decreasing toward the summer months, bottoming out around June/July (when the winter visitors leave the valley), and then rise again toward the end of the year. Prior to 1984, the final aircraft count in December of any year normally showed an overall increase in the number of based aircraft from the previous year. Since 1984, the December figures for based aircraft have fluctuated and in the past five years (1985-1990), December figures for the number of based aircraft have indicated a decrease in the numbers at the airport.

A trend line analysis of registered aircraft in Maricopa County was performed for the period from 1970 through 1989. The high growth rate in the county registered aircraft had been fairly consistent (17.8 percent average annual rate) until 1980, but since that time the growth has been relatively flat and, in fact, actually has been in decline since 1986. The recent declines have not shown any signs of ending and a reversal of this trend in the near term is not very likely.

A similar trendline was projected with the historical State registrations, producing an average annual growth rate of 2.48 percent during the same timeframe. A trendline of the airport's based aircraft records from 1980 to 1989 (based on the December based aircraft record) produced an average annual growth rate of approximately one percent. From the trendline analysis, it appears that all three based aircraft populations, the State, County and the airport, have been experiencing a significant decrease in the growth rate experienced in the 1970's.

Linear Regression Analysis

A linear regression on the registered aircraft data over time resulted in a very low correlation coefficient and a negative projection. Linear regressions with population, personal income and other economic data were also examined, including the consumer price index (CPI). Although the correlation was extremely low, the projection of based aircraft for Falcon Field appeared reasonable and is illustrated in Table 2B. Linear regression methods did not produce very good correlations, which led to an examination of forecasts by other methods.

TABLE 2B
Based Aircraft Forecast - Linear Regression
Mesa-Falcon Field

Years	U.S. C.P.I. R = .07
1995	771
2000	816
2005	873
2010	944
2015	1,003

The based aircraft at Falcon Field were compared to the State, County and Mesa populations for an 11 year period. Only the Mesa population provided any reasonable projection of potential based aircraft. Mesa's per capita based aircraft have averaged 3.4 aircraft per 1,000 population during the 1980-90 period. Based on the population projections for Mesa, this would result in 1,589 based aircraft by 2010 if the per capita aircraft rate remains constant. If the per capita aircraft rate were based upon the 1990 ratio (2.03), the based aircraft figure projected for 2010 would be 952. It appears from this analysis that population growth rates are much higher than the current based aircraft growth rates, resulting in much higher based aircraft projections than would appear reasonable.

Market Share Analysis

The decline in based aircraft at Falcon Field since the early 1980's was influenced by several factors: competition, economic recession, and the decline in general aviation sales. To study these factors in more detail, an analysis of local area airports (Scottsdale, Phoenix-Deer Valley and Chandler) and their share of both the county and the service area was conducted. **Table 2C** illustrates the historical aircraft registrations at each airport during the period 1983-1990, with a tabulation of market shares for two markets: the service area represented by the four airports and the County's registered aircraft. The registered aircraft at each airport was obtained from ADOT for each airport during the historical period. Although these figures do not agree with any of the airport's based aircraft figures, they provide a basis for comparison.

Falcon Field's share of MAG's registered aircraft has declined while Chandler and Deer Valley have increased their share slightly. Scottsdale's market share has stayed roughly unchanged. The most recent tabulations of the registered aircraft at these airports indicates that Scottsdale and Chandler's market share is increasing while Falcon Field and Deer Valley are experiencing a loss in market share. Chandler has increased its market share of the service area by nearly 55 percent and of MAG's aircraft registrations, 48 percent, during this period. **Exhibit 2A** depicts the airports in the MAG RASP.

TABLE 2C
Based Aircraft Comparisons

BASED AIRCRAFT

Year	Scottsdale Airport	Deer Valley Airport	Chandler Airport	Falcon Field
1983	459	657	165	707
1984	447	669	161	701
1985	462	638	155	739
1986	432	764	159	687
1987	409	754	188	641
1988	375	716	194	614
1989	414	637	243	593
1990	453	607	235	586
1991[1]	369	571	214	509
	PERCENTAGE OF MAG REGISTERED AIRCRAFT			
1983	12.69%	18.16%	4.56%	19.55%
1984	12.63%	18.91%	4.55%	19.81%
1985	13.03%	17.99%	4.37%	20.83%
1986	11.85%	20.96%	4.36%	18.85%
1987	11.50%	21.21%	5.29%	18.03%
1988	10.98%	20.97%	5.68%	17.98%
1989	12.70%	19.53%	7.45%	18.18%
1990	13.08%	17.52%	6.78%	16.92%
	PERCENTAGE OF AREA AIRPORTS			
1983	23.09%	33.05%	8.30%	35.56%
1984	22.60%	33.82%	8.14%	35.44%
1985	23.17%	32.00%	7.77%	37.06%
1986	21.16%	37.41%	7.79%	33.64%
1987	20.53%	37.85%	9.44%	32.18%
1988	19.75%	37.70%	10.22%	32.33%
1989	21.94%	33.76%	12.88%	31.43%
1990	24.08%	32.27%	12.15%	31.15%
1991[1]	22.19%	34.34%	12.78%	30.61%

SOURCE: ADOT Registered Aircraft Records 1983-1990. 1991 is a partial year and an estimate only.

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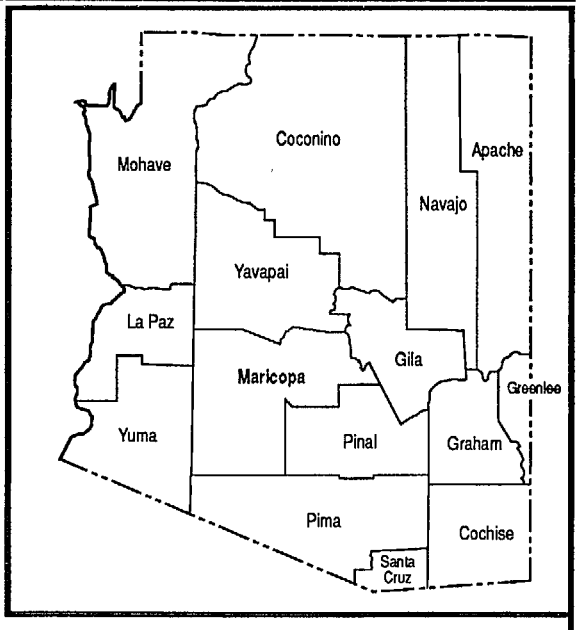
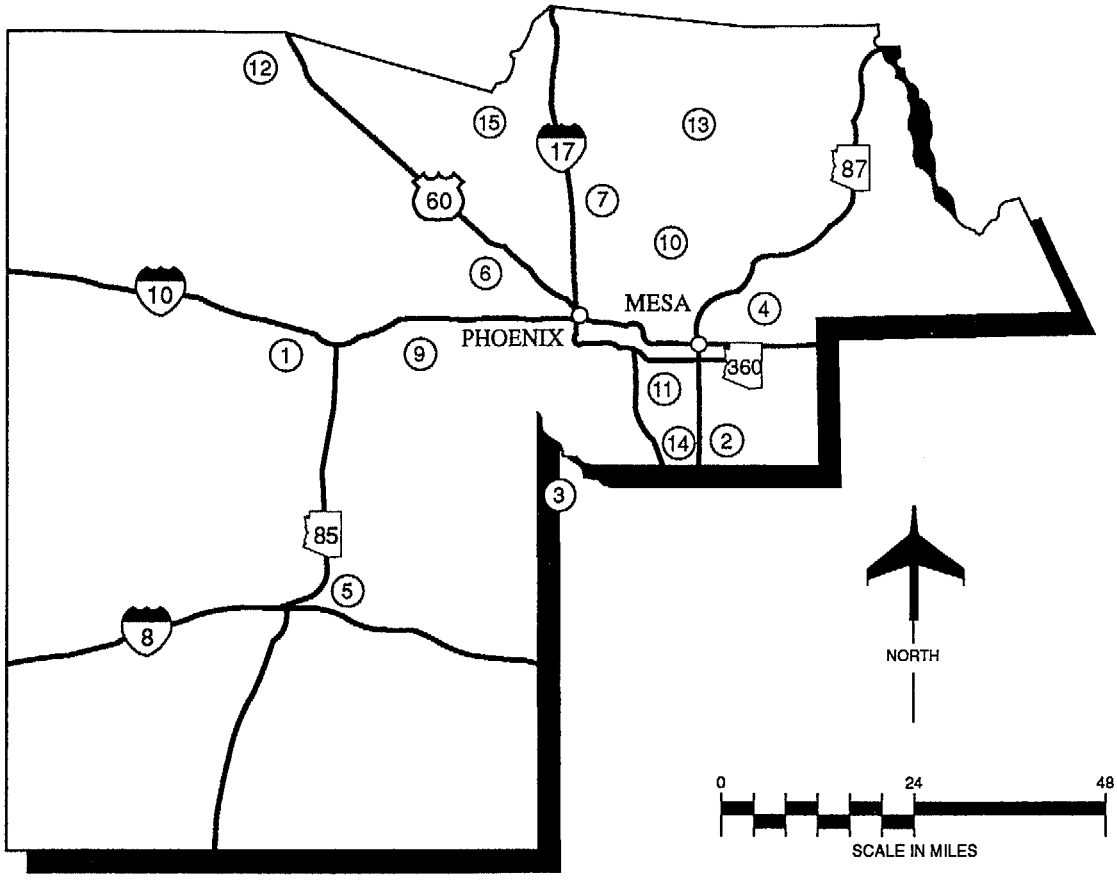
LEGEND:

1. Buckeye Municipal
2. Chandler Municipal
3. Estrella Sailport
4. Falcon Field
5. Gila Bend Municipal
6. Glendale Municipal
7. Phoenix Deer Valley Municipal
8. Phoenix Sky Harbor International
9. Phoenix Goodyear Municipal
10. Scottsdale
11. Stellar Airpark
12. Wickenburg Municipal
13. Carefree
14. Memorial
15. Pleasant Valley





MESA-FALCON FIELD

Exhibit 2A
MARICOPA ASSOCIATION OF
GOVERNMENT AIRPORTS

It is difficult to draw any conclusions from this analysis because the reasons for the decline do not appear to have any specific cause. More than likely the changes are due to the interaction of all these factors. The two airports with the largest number of based aircraft in the State (Deer Valley and Mesa-Falcon Field) appear to be impacted more than the other two airports. Chandler's increased share of both markets indicates that the economic recession has played only a minor role in the based aircraft fluctuations, tending to depress the total market rather than individual airports.

It is also important to point out that there is a wide disparity between the aircraft registration figures for Falcon Field and the based aircraft figures. Registrations reported to the State often do not reflect a change when the aircraft moves to another airport. Aircraft on an airport may be registered in another state and not in Arizona. These are some of the reasons for the discrepancy in reporting.

A market share of the projected aircraft registrations in the State and MAG during the planning period was also analyzed. In this method, the ratio of based aircraft at Falcon Field in 1989 to total registered aircraft in each of the aircraft registration markets was determined. This ratio was then applied to the forecasts for these same markets. Forecasts of these particular categories of registered aircraft were obtained from the sources indicated in Table 2D.

Another market share analysis was accomplished using a ratio based on the airport's average market share during the period 1980-1990. These two ratios produced different forecasts of based aircraft as indicated by the results illustrated in **Table 2D.** These forecasts are also displayed graphically in **Exhibit 2B.**

TABLE 2D
Based Aircraft Forecasts - Market Share
Mesa-Falcon Field

Years	Arizona Reg Acft[1]	Maricopa Cty Reg Acft[2]
Avg Market Share 1980-1990		
1995	714	744
2000	750	785
2005	785	846
2010	821	907
2015	869	969
Market Share - 1990		
1995	670	668
2000	704	705
2005	738	760
2010	771	815
2015	816	870

NOTES: (1) Arizona State Aviation System Plan, 1990, forecasts were used to project the future market.
(2) MAG, RASP, 1990, forecasts were used to project the future market, with projections for 2005 and 2010 tabulated by Coffman Associates.

Other Planning Forecasts

ADOT and MAG, the state and county aviation planning agencies that produce aviation system plans, also forecast the based aircraft projected for Falcon Field. These forecasts are presented in **Table 2E**. The Arizona State Aviation System Plan (ASASP) has the most pessimistic forecast of based aircraft at Falcon Field, with an expected average annual growth rate during the period of one percent, which is the same as the forecast annual growth rate for the State as a whole. The MAG RASP, projects an annual growth rate of 1.16 percent for Falcon Field while projecting a slightly higher annual growth rate for the MAG airports as a whole (1.3 percent).

TABLE 2E
Based Aircraft Forecasts
Mesa-Falcon Field

Forecast Year	ASASP 1990	MAG RASP 1990
1995	610	594
2000	637	604
2005	669	660
2010	703	716
2015	739	774

SOURCE: (1) ASASP, 1990.
(2) MAG RASP Update, 1990. Coffman Associates projection years 2005, 2010.

Preferred Based Aircraft Forecast

The selected planning forecast of based aircraft for Mesa-Falcon Field was based on the assumption that the present economic conditions will reverse and a positive economic growth pattern emerge in the valley as well as the County and State. The airport's based aircraft records appear to be picking up this trend as the most recent tabulation indicated a rise of nearly five percent in the number of based aircraft in the past six months.

It is anticipated that the airport would be capable of supporting an average annual growth rate of 1.5 percent during the planning period.

It must be emphasized that the forecast of based aircraft is a conservative figure and assumes that the airport will remain competitive with the airports within its service area. It appears that competitive pricing of facilities and services become more of a factor in an aircraft owners decision to base his aircraft when the economic outlook is not favorable. It was apparent during the recent economic recession that private as well as corporate aircraft owners were highly selective when given the opportunity to choose between competing facilities. **Table 2F** depicts the preferred based aircraft forecast for Falcon Field, which is also illustrated in **Exhibit 2B** in comparison with other based aircraft projections.

TABLE 2F
Preferred Based Aircraft Forecast
Mesa-Falcon Field

Years	Based Aircraft
1995	736
2000	762
2005	793
2010	823
2015	874

AIRCRAFT FLEET MIX

The aircraft fleet mix expected to utilize the airport is necessary in order to plan the facilities that will best serve not only the level of activity but also the type of activities occurring at the airport.

The mix of based aircraft at Mesa-Falcon Field was determined by an analysis of the types of aircraft currently registered in the county and based at Mesa-Falcon Field. A

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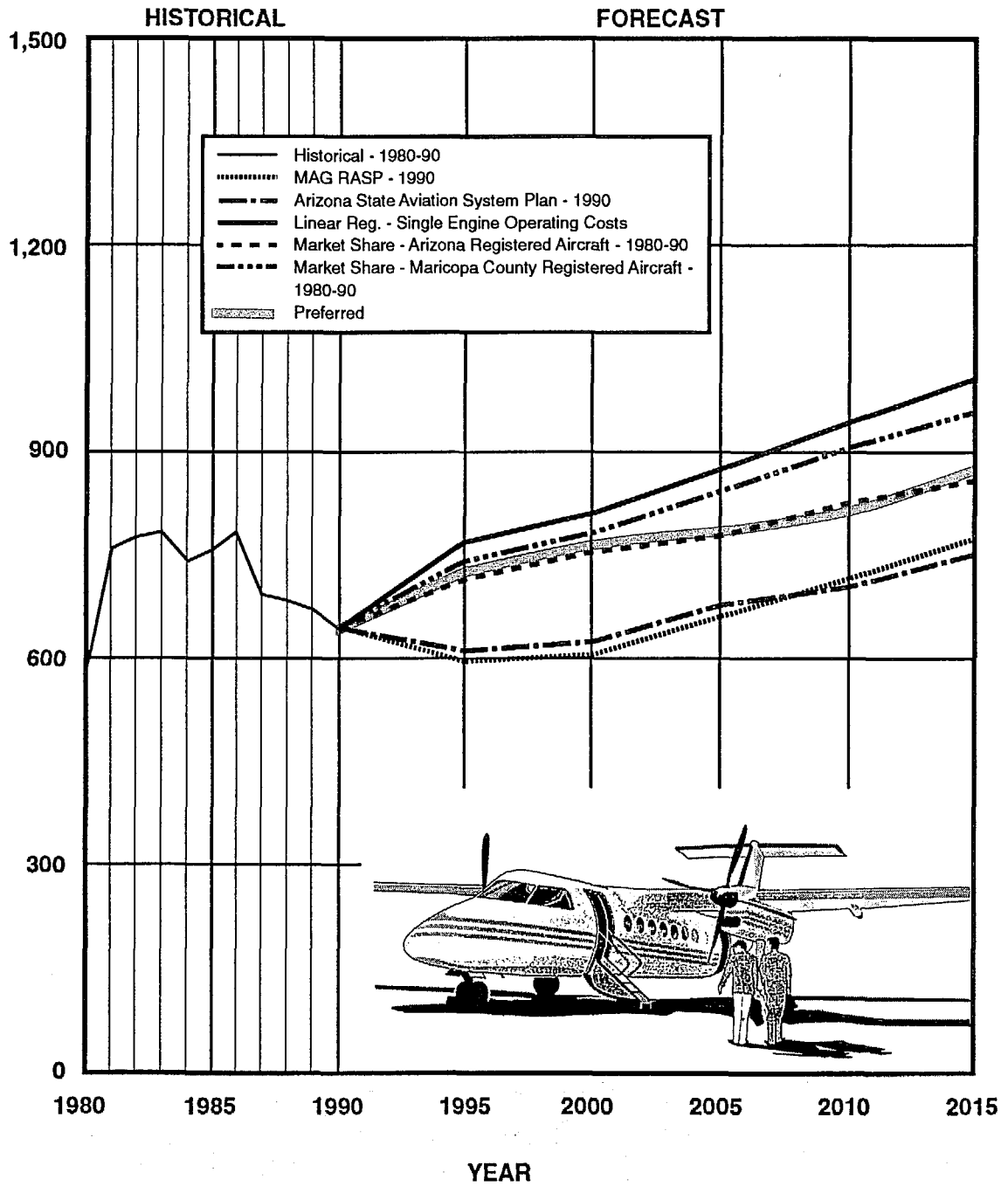

MESA-FALCON FIELD

Exhibit 2B
BASED AIRCRAFT FORECAST

concurrent analysis of based aircraft records at the airport produced an existing fleet mix. These were compared with the FAA statistical records of existing and forecast general aviation fleet mix in order to determine national trends. The national trend forecasts a slightly higher percentage of more sophisticated and higher performance aircraft in the future.

Historically, the County percentage fleet mix and the national fleet mix have not been the same, although the trends for both have followed similar patterns. That is, both have experienced decreases in the single engine piston aircraft percentage with increases in the percentage of other aircraft types. These same trends were applied to Mesa-Falcon Field's based aircraft to determine the forecast fleet mix. Another factor that influenced the fleet mix percentage was the aeronautical and high technology industry the area is attempting to attract.

High technology corporations, like many other national corporations, are more likely to use jet and turboprop aircraft. The existing and forecast fleet mix is shown in Table 2F.

TABLE 2F
Forecast Based Aircraft Fleet Mix
Mesa-Falcon Field

Type	Existing 1990	1995	2000	2005	2010	2015
Single Engine	597	663	667	684	701	739
Multi-Engine	32	49	59	75	85	87
Turbo prop	2	5	8	9	10	15
Turbo jet	0	1	2	3	4	5
Rotorcraft	12	18	20	22	24	28
Total	**643**	**736**	**762**	**793**	**823**	**874**

AIRCRAFT OPERATIONS

An airport operation is defined as any takeoff or landing performed by an aircraft. There are two basic types of operations: local and itinerant. A local operation is a takeoff or landing performed by an aircraft that will operate within the local traffic pattern within site of the airport or will execute simulated approaches or touch-and-go operations at the airport. Itinerant operations are all arrivals and departures other than local. Generally, local operations are characterized as training operations and itinerant operations are those aircraft with a specific destination away from the airport. Typically, itinerant operations increase with business and industry use since business aircraft are used primarily to carry people from one location to another.

Traditionally, general aviation operations have had a close correlation with the number of based aircraft at an airport. Generally, an airport the size and character of Mesa-Falcon Field can expect from 300 to 500 annual operations per based aircraft. This is typical of general aviation reliever airports in a metropolitan area.

An Airport Traffic Control Tower (ATCT) began operating at Falcon Field in 1980. The

activity records from this tower have been examined to determine historic and current operational levels at the airport. Total operations include the helicopter operations at the McDonnell Douglas facility beginning in January 1984. The operations were then compared to the based aircraft counts to establish a current operations per based aircraft ratio. This comparison is illustrated in Table 2G.

TABLE 2G
Historical Operations Per Based Aircraft
Mesa-Falcon Field

Year	Operations	Based Acft	Ops/BA
1980	248,410	587	423
1981	204,304	767	266
1982	177,458	774	229
1983	183,385	782	235
1984	176,909	743	238
1985	184,976	768	240
1986	181,361	784	231
1987	166,226	692	240
1988	147,101	682	215
1989	160,861	673	239
1990	203,685	643	316
1991	203,700	658	363

Ten Year Average (1980-90) 261
Five Year Average (1985-90) 278

SOURCE: Airport Records 1980-1991.

As can be seen from Table 2G, there has been some fluctuation from year to year in the operations from based aircraft figures, however, most of the ratios are lower then expected until recently. The average of 261 operations per based aircraft is lower than the norm. Apparently the high cost of operating an aircraft has had a significant impact on the operations-per-based aircraft ratio at this airport. However, the most recent experience indicates that there has been a significant increase in this ratio (the most recent estimate tabulated is 333 operations-per-based aircraft).

It appears there are several reasons for this increase. The number of fixed wing training operations conducted at the airport has increased as well as the number of operations conducted by McDonnell Douglas Helicopter. Since the establishment of the Phoenix Terminal Control Area, it has been more difficult for VFR aircraft, without appropriate avionics equipment to travel to other airports. Another factor may be the congestion at other airports. As depicted in Table 2H, Falcon Field had the fewest number of recorded operations of any of the area airports except Chandler from 1986 to 1990. Whatever the reason (and it appears a combination of factors is more likely than any single factor), the operations-per-based aircraft ratio at Falcon Field is rising.

TABLE 2H
Operations Comparisons
Mesa-Falcon Field

Years	Scottsdale	Deer Valley	Chandler
1983	149,023	246,037	80,000
1984	156,620	242,650	92,000
1985	170,559	244,554	123,000
1986	189,789	234,904	135,000
1987	188,043	241,605	151,200
1988	192,541	223,430	165,000
1989	229,816	232,437	170,000
1990	226,650	237,550	178,050

SOURCE: MAG RASP, 1990

A forecast of Falcon Field operations was prepared using a sliding operations-per-based aircraft ratio that leveled out at 400 operations-per-based aircraft during the planning period. This operational level is based on the current trend toward a much higher ratio than has been observed in recent years yet more the normal ratio for this size airport and in its role as a reliever in the NIAPS. The forecast based on an operations-per-based aircraft ratio is depicted in Table 2I.

TABLE 2I
Forecast of Operations
Operations-Per-Based Aircraft
Mesa-Falcon Field

Forecast	Operations
1995	294,400
2000	304,800
2005	317,200
2010	332,000
2015	349,600

SOURCE: Airport Records

Market Share Analysis

An analysis of an eight year historical market share of MAG airport operations produced an average market share for Falcon Field of 13.56 percent of MAG airport operations. Utilizing the MAG RASP forecast of MAG airport operations during the planning period, a market share of those operations were derived for Falcon Field. This forecast is illustrated as well, on **Exhibit 2C** and **Table 2J.**

TABLE 2J
Forecast of Operations - Market Share
Mesa-Falcon Field

Year	MAG Forecast Operations[1]	Falcon Field Operations
1995	1,533,080	207,900
2000	1,625,595	220,500
2005	1,749,900	237,300
2010	1,874,208	254,200
2015	1,998,515	271,000

SOURCE: [1] MAG RASP 1990 projections. Coffman Associates projections for 2005, 2010.

Other Operations Forecasts

As previously stated in the prior analysis of based aircraft at Falcon Field, the State (ASASP, 1990) and MAG (MAG RASP) project aviation activity for Falcon Field. The FAA also provides a forecast of operations at Falcon Field in the **Terminal Area Forecast, 1990-2001.** (TAF). Table 2K depicts the most recent projections for operational activity anticipated at Falcon Field.

As one can readily observe, the State and MAG have produced rather conservative estimates of operations at Falcon Field. The existing operations level exceeds the 2015 projection from the ASASP. These projections were developed during a substantial downturn in the economy and aviation in general, which is reflected in the low rate of growth (less than 1.5 percent average annual growth) in the operations level throughout the planning period. The airport is currently well on its way to surpassing the 2015 projection by the MAG RASP by the end of this year.

The FAA TAF appears to be a more realistic projection if the area economics continue positive throughout the planning period. All of these projections are illustrated on **Exhibit 2C.**

TABLE 2K
General Aviation Operations Forecast
Mesa-Falcon Field

Forecast Year	FAA TAF FY1990-05[1]	MAG RASP 1990[2]	ASASP 1990[3]
1995	213,000	174,175	154,900
2000	261,000	183,125	161,800
2005	309,000	195,280	170,200
2010	365,800	207,440	178,600
2015	419,700	219,600	189,000

SOURCE: [1] FAA Terminal Area Forecasts, FY1990-2005, Coffman Associates projections for 2010, 2015.
[2] MAG RASP Update, 1990. Coffman Associates projection for 2005, 2010.
[3] ASASP, 1990.

Preferred Operations Forecast

The annual aircraft operations forecasts for Mesa-Falcon Field has been developed based on existing activity and the previous projections of based aircraft. The operations-per-based aircraft factor was selected as most representative of the operations potential at the airport and projects an operation demand level of 349,600 operations by 2015. **Exhibit 2C** illustrates the expected growth in aircraft activity at Mesa-Falcon Field.

The ratio of local operations to itinerant operations has been increasing steadily since 1980. In 1980 the local activity accounted for approximately 44 percent of total operations. In 1990, this had increased to 63 percent and most recently has been estimated at 64 percent.

It is anticipated that the local operations will continue to increase as a percentage of total operations until midpoint in the planning period. At this point, itinerant operations will begin to increase as a percentage of the operational mix and continue that trend through the end of the planning period.

Table 2L illustrates the projected annual activity and the local/itinerant splits that can be expected at Mesa-Falcon Field throughout the planning period.

TABLE 2L
Preferred Annual Operations Forecast
Mesa-Falcon Field

	Total Operations	Local Operations	Itinerant Operations
Existing (1990)	203,685	127,786	75,899
1995	294,400	197,248	97,152
2000	304,800	210,312	94,488
2005	317,200	225,212	91,988
2010	332,000	229,080	102,920
2015	349,600	227,240	122,360

MILITARY ACTIVITY

Military operations play an important role in the air traffic activity at Mesa-Falcon Field. Currently, military operations account for less than three percent of total operational activity. The military activity has gradually increased, especially throughout the military buildup for Operation Desert Storm. For planning purposes, the military activity has been projected at its current annualized levels of approximately three percent of annual operations until 2010 and then declining to two percent during the latter half of the planning period.

The military activity consists primarily of helicopter activity, most of which is conducted by the McDonnell Douglas Helicopter Company. In discussions with plant personnel, it is anticipated that helicopter operations will continue at basically the same level throughout the period, with short periods of greater or lesser activity as new aircraft are brought into production and older types are phased out.

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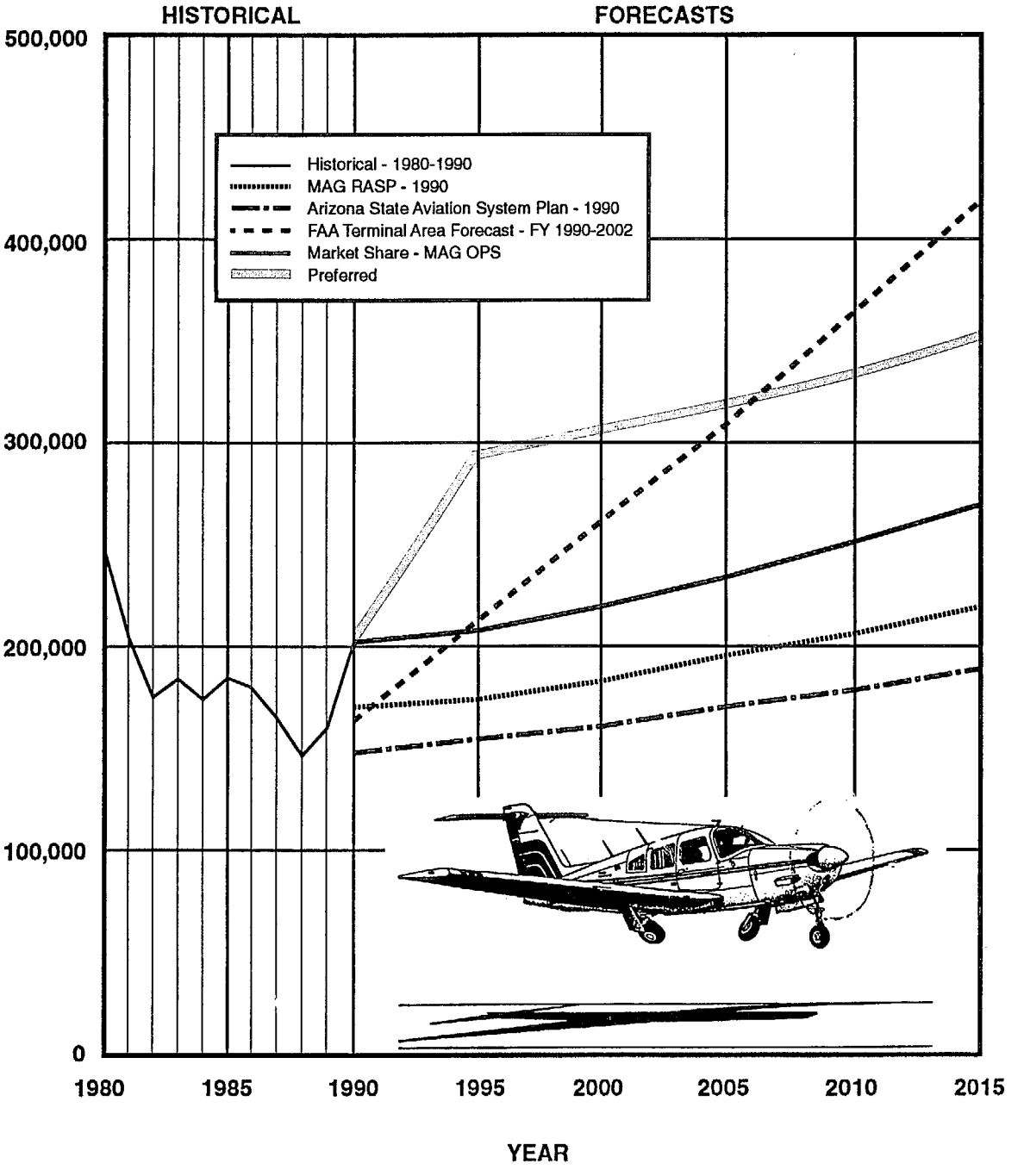

MESA-FALCON FIELD

Exhibit 2C
OPERATIONS FORECAST

Military activity also consists of twin engine turboprop operations and other U.S. Army helicopter activity. The anticipated military activity (exclusive of military operations conducted at McDonnell Douglas Helicopter Co.) throughout the planning period is indicated in **Table 2M**.

TABLE 2M
Forecast Military Operations
Mesa-Falcon Field

	Local	Itinerant	Total
Existing (1990)	4,930	437	5,367
1995	9,862	2,498	12,290
2000	10,515	2,366	12,881
2005	11,260	2,299	13,559
2010	11,454	1,544	12,998
2015	11,362	1,835	13,197

ANNUAL INSTRUMENT APPROACHES

Forecasts of annual instrument approaches (AIA) provide guidance in determining an airport's requirements for navigational aid facilities. An instrument approach is defined by FAA as *"...an approach to an airport with intent to land by an aircraft in accordance with an Instrument Flight Rule (IFR) flight plan, when the visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude."*

Examination of weather records show a very low occurrence of actual IFR weather conditions in the area. IFR weather conditions occur less than one percent of the time, therefore, actual instrument approaches at Falcon Field are low (less than two percent annually). It is anticipated that actual instrument approach conditions experienced at the airport will not change during the planning period. Therefore, an average of one percent of total annual operations was used to forecast the total annual instrument approaches expected at the airport.

Table 2N depicts the types of instrument approach activity anticipated at the airport. This distribution was determined from a one year analysis of Falcon Field instrument approach data obtained from Phoenix TRACON records.

TABLE 2N
Forecast of Annual Instrument Approaches
Mesa-Falcon Field

	Forecast			
Year	Air Taxi	General Aviation	Military	Total
Existing (1990)	9	1,875	85	1,969
1995	13	2,804	127	2,944
2000	14	2,902	132	3,048
2005	15	3,020	137	3,172
2010	16	3,161	143	3,320
2015	17	3,328	151	3,496

PEAKING CHARACTERISTICS

Many airport facility needs are related to the levels of activity during peak periods. The periods used in developing facility requirements for this Master Plan are:

- **Peak Month** - The calendar month when peak aircraft operations occur.
- **Design Day** - The average day in the peak month. Normally, this indicator is easily derived by dividing the peak month operations by the number of days in the month.
- **Busy Day** - The busy day of a typical week in the peak month. This descriptor is used primarily to determine general aviation ramp space needs.
- **Design Hour** - The peak hour within the design day. Design hour is used particularly in airfield demand/capacity analysis as well as for terminal building and access requirements.

It is important to note that only the peak month is an absolute peak within a given year. All the others will be exceeded at various times during the year. However, they do represent reasonable planning standards that can be applied without over building or being too restrictive.

At Mesa-Falcon Field, the peak month activity levels have averaged 9.93 percent of annual operations over the past ten years. This percentage can be expected to decrease slightly during the planning period as aircraft operational activity increases. For planning purposes, the peak month has been projected to decline to 9 percent of annual operations by the end of the planning period.

The Design Day, also called the average day of the peak month, will vary from year to year depending on the number of operations during the peak month. In an analysis of the peak months over the ten year period, there were normally 31 days in the peak month. March was the peak month five times in ten years.

The Busy Day operations for a general aviation airport typically will run ten to twenty percent greater than an average day. At Falcon Field, the busy day is 123 percent greater than the design day. The busy day operations factor is expected to decline as a percentage of the design day to 118 percent by the end of the planning period.

Design Hour operations are used to establish the peak hourly demand affecting airfield and terminal facilities. Currently, the Design Hour operations are averaging approximately 17.7 percent of the design day operations. This is normal for an active general aviation airport. Design Hour operations are also anticipated to decline to about 15 percent of the average day by the end of the planning period.

The peaking characteristics were applied to the forecast annual operations to obtain future peak operations at Mesa-Falcon Field. Experience has shown that as activity begins to increase, peak periods will begin to level out. A summary of these four peaking characteristics for the planning period is presented in Table 2O.

The definition of general aviation passengers, as used in this section, refers to the average number of pilots and passengers expected to utilize the airport's terminal facilities during a given time.

Touch-and-go operations would be an exception to the higher passenger levels anticipated. Pilots conducting touch-and-go operations may only use the terminal facilities at the start and finish of their training activity. In order to ensure that space requirements are not overestimated in the planning effort, these operations were not considered in determining design hour passengers. In

TABLE 2O
Forecast of Peak Operations
Mesa-Falcon Field

	Existing (1990)	1995	2000	2005	2015
Annual Operations	203,685	294,000	304,800	317,200	349,600
Peak Month Operations	20,272	29,145	29,565	30,134	31,464
Design Day Operations	654	940	954	972	1,015
Busy Day Operations	915	1,147	1,154	1,166	1,198
Design Hour	116	141	143	146	152
Design Hour Passengers	54	71	72	73	82

calculating the design hour passengers, an average of 2.0 passengers per operation, excluding touch-and-go operations, was assumed for the existing condition. It is anticipated that the passenger ratio will rise to 2.5 by the end of the planning period as larger aircraft utilize the airport.

SUMMARY

This chapter has provided forecasts for those indicators of aviation demand that are essential to effective analysis of future facility needs of the airport. The next step in the master planning process is to assess the capacity of the existing facilities and to determine what facilities will be necessary to meet future aviation demands. Those will be examined in the following two chapters. Table 2P is provided as a summary of forecast information for referral in later portions of the study.

TABLE 2P
Summary of Aviation Forecasts
Mesa-Falcon Field

Descriptor	Existing (1990)	1995	2000	2005	2015
Annual Operations					
Itinerant					
General Aviation	75,366	94,239	91,260	89,089	119,725
Air Taxi	96	485	500	600	800
Military	437	2,428	2,368	2,299	1,835
Local					
General Aviation	122,856	187,386	199,797	213,952	215,878
Military	4,930	9,862	10,515	11,260	11,362
Total	**203,685**	**294,400**	**304,800**	**317,200**	**349,600**
Based Aircraft					
Single Engine	597	663	667	684	739
Multi-Engine	32	49	65	75	87
Turbo prop	2	5	8	9	15
Turbo jet	0	1	2	3	5
Rotorcraft	12	18	20	22	28
Total	**643**	**736**	**762**	**793**	**874**
Annual Instrument Approaches					
Air Taxi	9	13	14	15	17
General Aviation	1,875	2,804	2,902	3,020	3,328
Military	85	127	132	137	151
Total	**1,969**	**2,944**	**3,048**	**3,172**	**3,496**